

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
RESEARCH AND TECHNOLOGY RESUME

**TITLE** Submillimeter and Millimeter Observations of Solar System Objects  
NASA Grant NGL 05-002-114

**PERFORMING ORGANIZATION** Division of Geological and Planetary Sciences  
California Institute of Technology  
Pasadena, CA 91125

**INVESTIGATOR'S NAME**  
Professor Duane O. Muhleman

**DESCRIPTION** (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

A. Planetary atmospheres and satellite surfaces are observed with the three element array at Caltech's Owens Valley Radio Observatory, Caltech's submillimeter telescope on Mauna Kea and at the 12-meter telescope at Kitt Peak. We are primarily interested in spectroscopy of the atmospheres of Venus, Mars and Titan and the continuum structure of Saturn Rings, Galilean satellites, Neptune and Uranus.

B. During the last year we completed a supersynthesis of the Saturn system at 2.8 mm with spatial resolution of 3 arc sec. We just completed a 4-configuration synthesis of Venus in the CO absorption line. We hope to recover the wind patterns in the altitude range from 60 to 100 km where winds have never been measured. Two important questions are being investigated: (1) how high in the Venus atmosphere do the 4-day winds extend and (2) can we produce experiment proof (or disproof) of the subsolar-to anti-solar flow (Dickenson winds) predicted by general circulation models?

C. During the Next year we will reduce and analyze all of the data discussed above, make an even greater effort to measure the CO in the atmosphere of Titan and study the CO distribution in the atmosphere of Mars. The latter requires new observations.

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D. Bibliography:

Aperture Synthesis Observations of Saturn and its Rings at 2.7mm Wavelength.  
T.E. Dowling, D.O. Muhleman and G.L. Berge, *Icarus* 70, 506-516 (1987).

Observations of Mars, Uranus, Neptune, Io, Europa, Ganymede and Callisto at a  
Wavelength of 2.66 Millimeters. Duane O. Muhleman and Glenn L. Berge.  
Ready for submission to *Icarus*.